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EXAMINER	
CHU, RANDOLPH I	

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/507,419	BAYER ET AL.	
	Examiner	Art Unit	
	RANDOLPH CHU	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 10-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

In response to applicant's amendment received on December 3, 2007, all requested changes to the claims have been entered. New claims 23 and 24 have been entered.

Response to Argument

3. Applicant's arguments filed on December 3, 2007 have been fully considered but they are not persuasive.

Applicant's argue on page 10 of the response that the disclosure of Polz teaches an interpolation" method and instant application teaches an "extrapolation" method.

The examiner agrees that the prior art of Polz teaches an "interpolation" method, but that instant application also teaches an "interpolation" method to determine second space element by "interpolation" method (para [0056]).

Applicant's argue on pages 10-11 of the response that the disclosure of Polz does not teaches an "predetermined multidimensional voxel space".

The examiner disagrees. The prior art of Polz's data set 19 in figure 6 can be interpreted as predetermined multidimensional voxel space. And also, the claim of instant application does not disclose "predetermined multidimensional voxel space".

The specification does not disclose how the transformation is based on one search beam. The examiner can not find this language in the specification. The examiner can not figure out how a transformation is done by a search beam running. The transformation appears to be a linear interpolation using weights. Further clarification in the claim is needed for the transformations.

Mathematically, a transformation is based on some set of values. The term "search beam running" is not a set of values. The Examiner suggests clarifying in the claim the value/elements used for the transformation.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-8 and 10-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the partial image area" in 11th line. There is insufficient antecedent basis for this limitation in the claim.

Claim 1 is further indefinite for stating "transformation includes at least one search beam running". The examiner can not find this language in the specification. The examiner can not figure out how a transformation is done by a search beam

running. The transformation appears to be a linear interpolation using weights. Further clarification in the claim is needed for the transformations.

Claims 2-8 and 10-17 depend on indefinite antecedent claims.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-8, 10-13, 18-21 and 23 as best understood, are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 5,924,989 to Polz.

With respect to claim 1, Polz teaches, means of recordings of one- or two-dimensional partial image areas of the object (ultrasound image in each dimension) (abstract),

using wherein the absolute positions of the individual partial image areas in space (col. 4 lines 7-18) or the relative positions of the individual partial image areas (col. 3 lines 28-32) to each other are used along with the one- or two-dimensional image information of the individual partial image areas for generating one- or two-dimensional image data, (col. 4 lines 7-18)

wherein a first group of space elements (individual image) is generated in a multidimensional voxel space (data set, ref. no. 19) from first space elements (image points) which contain multidimensional image information and touch or intersect planes or lines of the partial image areas by the one- or two-dimensional image data, wherein a second group of space elements is generated in the multidimensional voxel space from second space elements by means of an information transformation from the multidimensional image information of the first group of space elements (col. 6 lines 49-52, Figure 6 and 7)

wherein said information transformation includes at least one search beam (X1 – X4) running from each first space element (point that intersect with X1-X4 and BE1-BE4) along a pre-determinable multidimensional direction vector, thereby defining those second space (V) elements determined by the multidimensional image information of that first space element which forms a starting point of the search beam (col. 7 line 3-45, Figure 7).

With respect to claim 2, Polz teaches that the multidimensional image information of each first space element is determined by one- or two-dimensional image information which exists at a particular interface/point of contact of the respective first space element with a respective plane or line of the partial image area (col. 4 lines 7-18).

With respect to claim 3, Polz teaches that a spatial distance from each second space element to the next first space element of the first group of space elements is

determined, and the multidimensional image information of each second space element is determined by the multidimensional image information of the spatially nearest first space element (col. 7 line 3-45, Figure 7).

With respect to claim 4, Polz teaches that the multidimensional image information of each second space element is not determined when the spatial distance to the nearest first space element is larger than a pre-determinable maximum spatial distance (maximum distance C) (col. 7 lines 26-45, Figure 7).

With respect to claim 5, Polz teaches that the multidimensional image information of the spatially nearest first space element is used as multidimensional image information of each second space element lying within a maximum spatial distance to a first space element (col. 7 line 3-45, Figure 7).

With respect to claim 6, Polz teaches that the spatial distance and a reference number for the plane or line of the partial image area used to determine the multidimensional image information of the nearest first space element, is stored as multidimensional image information of each second space element (X1 to X4) (col. 7 lines 26-45, Figure 7).

With respect to claim 7, Polz teaches that the spatial distances from each second space element to two or more first space elements of the first group of space elements

are determined, and the multidimensional image information of each second space element is determined by the multidimensional image information of a predeterminable number of spatially and/or chronologically nearest first space elements (col. 7 line 3-45, Figure 7).

With respect to claim 8, Polz teaches that the multidimensional image information of each second space element is determined by the multidimensional image information, weighted on the different spatial distances, of a pre-determinable number of first space elements (col. 7 line 3-45, Figure 7).

With respect to claim 10, Polz teaches that the search beam (X1 – X4) has spatial starting point (V) on the plane or line of the partial image area used to determine the multidimensional image information of the first space element, and the search beam has a maximum spatial length (C) along the pre-determinable multidimensional direction vector (X1 – X4) (col. 7 line 3-45, Figure 7).

With respect to claim 11, Polz teaches that the second space elements are determined by the multidimensional image information of another first space element of the first group of space elements, which constitutes a target point which is hit by the search beam (point that intersect with X1-X4 and BE1-BE4) (col. 7 line 3-45, Figure 7).

With respect to claim 12, Polz teaches that the second space elements are determined weighted multidimensional image information of the starting point and the target point, wherein the weights orientate themselves at multidimensional distances of each second space element (10b), lying on the search beam, to the starting or target point (col. 7 line 3-45, Figure 7).

With respect to claim 13, Polz teaches that the second space elements are determined in a first step by means of the multidimensional image information of that first space element which forms the starting point of the search beam , and that the second space elements are weighted in further steps by multidimensional image information of further first space elements which form starting points of search beams which also penetrate the second space elements, wherein the weights orientate themselves at the multidimensional distances of each second space element to the respective starting points (col. 7 line 3-45, Figure 7).

With respect to claim 18, please refer to rejection for claim 1, and first, second and third storage means are disclosed in Figure 1 (ref. no. 2).

With respect to claim 19, Polz teaches that the object is reconstructed and represented in a display by spanning the multidimensional voxel space by means of the first and second group of space elements (col. 6 lines 49-52, Figure 6 and 7).

With respect to claim 20, Polz teaches that calculation means carry out the information transformation from data of the first and second storage means and store the results in the third storage means (Figure1).

With respect to claim 21, Polz teaches the multidimensional reconstruction and representation of an organ, especially the heart of a creature, considering the motion of the heart (col. 4 lines 39- col. 5 line 12).

With respect to claim 23, please refer to rejection for 21.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 14, 16 and 17 are rejected under 35 USC 103(a) as being unpatentable over Polz (US Patent 5,924,989) in view of Edwards et al. (US Patent 5,787,889).

With respect to claim 14, Polz teaches all the limitations of claim 1 as applied above from which claim 14 respectively depend.

Polz also teaches not disclose expressly that the object is reconstructed and represented multidimensionally by means of the multidimensional voxel space consisting of the first and second group of space element (col. 6 lines 49-52, Figure 6 and 7).

Polz does not teach expressly that parts of the reconstructed object are represented by means of variable sectional planes.

Edward et al. teaches parts of the reconstructed object are represented by means of variable sectional planes (col. 14 line 65 – col. 15 line 53).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to represent variable sectional planes of reconstructed object in the method of Polz.

The suggestion/motivation for doing so would have been that reconstructed object could visualize in various viewing angle of the image by represent variable sectional plane of reconstructed multidimensional image.

Therefore, it would have been obvious to combine Edward et al. with Polz to obtain the invention as specified in claim 14.

With respect to claim 16, Edward et al teaches that certain parts of the multidimensional voxel space are marked and sampled for representation on one side of an intersectional plane in order to visualize certain parts of the reconstructed object (col. 14 line 65 – col. 15 line 53).

With respect to claim 16, Edward et al teaches that the multidimensional voxel space (9) is sampled by means of an intersectional plane (18) into at least two halves (9a, 9b) to visualize certain parts of the reconstructed object (17), and that the intersectional plane and/or the at least two halves (9a, 9b) are pivotable/rotatable and/or displaceable in different multidimensional directions (col. 14 line 65 – col. 15 line 53).

7. Claim 15 is rejected under 35 USC 103(a) as being unpatentable over Polz (US Patent 5,924,989) in view of Edwards et al. (US Patent 5,787,889) and in further view of Pini (US Patent 5,159,931).

Polz in view of Edwards et al. teaches all the limitations of claim 14 as applied above from which claim 15 respectively depend.

Polz in view of Edwards et al. does not teach expressly that the reconstructed object or parts thereof will be represented or equipped with pre-determinable characteristics like colour or resistance.

Pini teaches reconstructed object or parts thereof will be represented or equipped with pre-determinable characteristics like color (col. 15 lines 10-32).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to represent reconstructed multidimensional object with color in the method of Polz and Edward et al.

The suggestion/motivation for doing so would have been that this kind of representation allows the visualization of a section of contour of the object in detail such as blood flow.

Therefore, it would have been obvious to combine Pini with Polz and Edward et al. to obtain the invention as specified in claim 15.

8. Claims 22 and 24 are rejected under 35 USC 103(a) as being unpatentable over Polz (US Patent 5,924,989) in view of Weisman et al. (US Patent 6,674,879).

Polz discloses all the limitations of claim 1 and 18 as applied above from which claim 22 respectively depend.

Polz does not teach expressly that the method or device is used for the transthoracal (TTE), transoesophagic (TEE) or intravascular (IVUS) echocardiography or intraductal (IDUS) sonography.

Weisman et al. teaches echocardiography is used for 3-D reconstruction (col. 2. 45-57).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use echocardiography for 3-D reconstruction in the method of Polz.

The suggestion/motivation for doing so would have been that various conventional ultrasound methods could be used to generate tomography image for multidimensional reconstruction.

Therefore, it would have been obvious to combine Weisman et al. with Polz to obtain the invention as specified in claim 22.

With respect to claim 24, please refer to rejection for claim 22.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randolph Chu whose telephone number is 571-270-1145. The examiner can normally be reached on Monday to Thursday from 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on 571-272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RIC/

/Matthew C Bella/

Supervisory Patent Examiner, Art Unit 2624